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NOTE BY THE SECRETARY-GENERAL

The Secretary-General has the honour to transmit to the members of the Security Council the attached communication which he has received from the Director-General of the International Atomic Energy Agency (IAEA).

Annex

Letter dated 25 July 1991 from the Director-General of the International Atomic Energy addressed to the Secretary-General

Please find attached the report of the third IAEA Inspection in Iraq under Security Council resolution 687 (1991). You may deem it appropriate to transmit the report to the members of the Security Council. I remain of course available with the Chief Inspector, Mr. Demetrius Perricos, for any consultations you or the Council may wish to have. I am planning to go to the United States on 28 July.

(Signed) Hans BLIX

Enclosure

REPORT ON THE THIRD IAEA ON-SITE INSPECTION IN IRAQ UNDER SECURITY COUNCIL RESOLUTION 687 (1991)

7-18 July 1991

Salient points

The IAEA team, which arrived on the eve of the day when the Government of Iraq disclosed its enrichment programme, devoted most of its time to performing inspections in order to verify the Government's declaration and fill gaps in it and to seeking explanations.

Although the Iraqi side was cooperative in facilitating the team's efforts and provided many clarifications about the declared enrichment programme, the team considers it likely that the full extent of the centrifuge enrichment work has not yet been disclosed; the possibility also exists that there are still undeclared locations with sensitive equipment and material.

The leader of Iraq's enrichment programme, Dr. J. Jaffar, Deputy Chairman of the Iraqi Atomic Energy Commission and Deputy Minister for Industry and Minerals, denied that any political decision had been taken to use the enrichment programme to develop nuclear weapons. The primary aims were stated to be development of the country's technological and industrial infrastructure and the production of fuel for research reactors and a future nuclear power programme. The team noted that the possibility of combining separators with high capacity/modest separation factor and separators with low capacity/high separation factor suggests a specific intention to produce highly enriched uranium.

Through imports and indigenous production, Iraq had accumulated a large inventory of natural uranium.

Uranium tetrachloride - feed material for the electromagnetic isotope separation (EMIS) enrichment method - was produced in a factory outside Mosul and at Tuwaitha. The buildings were severely damaged.

The Iraqi side confirmed earlier inspectors' suspicions that Tarmiya was the main production site for the enrichment of uranium by the EMIS method. A layer of concrete which had been poured over a key component of the separators in order to conceal it was removed at the request of the team, which was then able to confirm that the installation in question had indeed been constructed for enrichment purposes.

The Iraqi side gave the team videotapes showing the inauguration of the Tarmiya plant (in February 1990) and what the plant looked like after the bombing; it had been extensively damaged. The team made a tape of what it looks like now.

On the basis of the design data provided by the Iraqi side, the team considers that Tarmiya, if fully operational, with 90 separators running at design capacity, could have produced up to 15 kilograms of highly enriched (93 per cent) uranium a year, or proportionally more uranium at a lower enrichment.

It was confirmed that, as surmised, the facility at Ash Sharqat had been built as a replica of Tarmiya and was not, as alleged during the inspection, a factory for the plastic coating of equipment. Most of the facility was destroyed by bombing, at which time it was about 85 per cent completed; no separators had yet been installed.

Milligram quantities of uranium enriched to a level of 40-45 per cent and other quantities enriched to lower levels at Tuwaitha were declared. At Tarmiya, batches of uranium with enrichment levels ranging up to 10 per cent were declared, giving together 0.6 kilograms with an average enrichment level of 4 per cent.

It was confirmed that the Research Centre at Tuwaitha was the site of all the research and development work on uranium enrichment, including EMIS, centrifuge enrichment and chemical enrichment. The relevant facilities at Tuwaitha were completely destroyed.

INTRODUCTION

1. The present report summarizes findings of the third inspection carried out by IAEA under the terms of Security Council resolution 687 (1991) with the assistance and cooperation of the Special Commission of the United Nations. The team consisted of 26 inspectors and 11 supporting staff, comprising 22 nationalities. It was headed by Mr. Demetrius Perricos of IAEA as Chief Inspector. The team arrived in Iraq on 6 July 1991 and started the inspection on 7 July. The original schedule was for the inspection to end on 12 July but, owing to a new declaration of the Iraqi authorities dated 7 July which provided additional information on Iraq's nuclear programme, it was necessary to extend the inspection to 19 July. The team was reduced to 20 inspectors as from 13 July.

2. The inspection team verified, to a large extent, the information contained in the Iraqi declaration of 7 July regarding Iraq's enrichment programme, which was supplemented by information presented to the team at its request on 14 July. A number of follow-up actions have been identified and will have to be performed during subsequent inspection missions. It was not possible for the inspection team to verify the extent of the centrifuge enrichment programme, nor could the team exclude the possibility that there are still undeclared locations with sensitive equipment or material installed, in use or stored. In addition, the industrial and technological infrastructure which has been built in connection with this programme has to be assessed, and the information provided to the team regarding the industrial establishments involved in this effort has to be verified.

3. The process of additional clarification by Iraq and subsequent verification and further questioning by the inspection team went on throughout the two-week inspection period, and it will continue during subsequent inspections. A large number of samples were collected, but they have not yet been analysed; also, many documents, some provided by Iraq and others collected at various sites by the inspection team, have still to be fully evaluated. No access problems were encountered and the attitude of the Iraqi authorities to the team was one of cooperation throughout the period of the inspection.

I. THE IRAQI ENRICHMENT PROGRAMME

4. According to a statement by Dr. J. Jaffar, leader of the enrichment programme, Vice-Chairman of the Iraqi Atomic Energy Commission and Deputy Minister for Industry and Minerals, the primary motive for proceeding with a uranium enrichment programme was the expected contribution to the technological and industrial infrastructure of the country regardless of whether the programme was successful. The need for uranium enrichment was ascribed to the need to fuel research reactors and possibly, at some point in the future, power reactors. Dr. Jaffar noted that a capability to produce highly enriched uranium may create, in his words, a "political option" for the

development of nuclear weapons. However, he steadfastly denied that a decision to develop nuclear weapons had been taken or that any weapons development work had been done.

5. At one time or another, gaseous diffusion, electromagnetic isotope separation (EMIS), gas centrifuge and chemical exchange technologies were examined by Iraq. The commitment to EMIS for production-scale development and deployment followed early successes with the method and, more importantly, the demonstration that the separator units and magnets could be made in Iraq.

6. According to the disclosures made to date, efforts comparable to that devoted to EMIS were not made as regards other separation technologies. Iraqi declarations indicate that research on gas centrifuge technology was second in priority and that some promising results were recently achieved, including successful single-machine trials with UF_6 gas. Operating data from some of these trials were presented to the inspection team on the last day of the inspection period, but it seems likely that the full extent of the centrifuge work has not been disclosed. There is no doubt that Iraq has developed the technological and industrial infrastructure necessary for EMIS. As far as centrifuge enrichment is concerned, Iraq was developing an indigenous technology even if they were dependent on foreign suppliers for key components and materials.

A. Uranium enrichment research and development at Tuwaitha

7. Research, development and testing of EMIS components were carried out in the Nuclear Physics Building (80).* Reviews of an Iraqi-provided videotape showing the EMIS facilities in the building, together with examinations of components of the 1,000-millimetre separators (this number refers to the radius of the ion beam in the separator tank) and the model 106 ion source test stand are consistent with Iraq's declaration. In the opinion of the inspection team, the facility was not designed for - nor was it capable of - producing enriched uranium in quantity. The Iraqi statement that the only real obstacle remaining in the development of an efficient EMIS system was an improved ion source is consistent with experience elsewhere in the world. Work on graphite collectors and on the configuration of ion sources and collectors was also carried out in this building. Research on EMIS chemistry was carried out in the nearby Chemical Research Building (85). A small pilot line for the production of UCl_4 was also contained in this building. Both buildings, 80 and 85, have been levelled and the rubble removed. Experiments with gas centrifuge enrichment were declared by Iraq to have occurred in the Cold Material Testing Building (63).

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* The numbers in parentheses refer to the locations indicated on the Tuwaitha site map in annex I to the present report.

B. Acquisition of natural uranium (Al Qaim and Akashat)

8. Iraq has accumulated, through imports and indigenous production, a large inventory of natural uranium. The indigenous material is largely from an uranium extraction facility (producing yellow cake) associated with a superphosphate plant at Al Qaim. The facility was extensively damaged during the bombing. There is no evidence that the facility served any purpose beyond that declared. The operator stated that a total of 168 metric tons have been produced since the facility was commissioned in 1984. This amount is considerably below the production capacity of 103 metric tons a year. The operator's explanation was that the uranium content of the phosphate ore was far lower than expected. Samples of the ore were taken to investigate this issue.

9. Akashat is an open-cast mine which feeds Al Qaim. No other activities were detected during the inspection.

C. UO_2 conversion and UCl_4 production (Mosul Production Facility)

10. The team founded that UCl_4 production had been carried out at a facility outside Mosul. A standard production process with UO_2 feed and CCl_4 as the chlorination reagent was used. The facility included a UO_2 conversion capability. It was stated that the UCl_4 plant had gone into production in August 1990 and operated for about six months. The plant manager indicated that production had been limited for most of that time because of corrosion problems. The inspection team found no evidence contradicting those statements. The UCl_4 production building had suffered substantial damage, and the UO_2 building had completely collapsed and was covered with debris. There was also an Iraqi statement that the UCl_4 used for EMIS development and testing at Tuwaitha and Tarmiya had been produced in Building 85 at Tuwaitha.

D. EMIS: the facilities at Tarmiya and Ash Shargat

11. The Tarmiya site has been described in previous inspection reports (see S/22788). The third inspection team visited the site again following Iraqi confirmation that the site had been used for EMIS and further declarations regarding the extent of the EMIS installations and operations. The team found evidence confirming statements about the number and type (1,200 mm) of EMIS units installed in Building 33. The process building contained two areas (A and B) for EMIS installations. An eight-separator system (nine magnets) had been installed in area A during January and February 1990. A 17-separator system was in the process of being installed (three magnets were in place) in area B at the time operations ceased.

12. In an attempt to conceal the EMIS equipment from the inspection teams, the return irons and rails for the separators had been covered with concrete. This was removed at the team's request. The length of the installed return

iron in both area A and area B conformed to system specifications provided by Iraq and to independent separator component measurements made by the inspection team.

13. An Iraqi video film made at the time when the installation of magnets, vacuum chambers and end pieces for the eight-separator system was completed (February 1990) and one made in February 1991, after the bombing, were provided to the inspection team. The latter video film appeared to confirm that only three magnets had been installed, without vacuum chambers, and that area B had therefore not yet been operational. A computer printout showing the performance of one of the separators during a run late in December 1990 was provided. The data have not been examined in detail, but it appears that the ion beam current was not up to the design value. The number of separators ultimately intended for Building 33 has not been determined. The facility design provides for a maximum of 70 separators, but Iraqi authorities indicated that no decision had been taken beyond those concerning the 25 separators installed or being installed. Facility specifications indicate that Building 245 was designed to accommodate 20 of the smaller (600 mm) units, which have a higher separation factor. Uranium recovery, the construction and configuration of ion sources and collectors and the construction of separator tank liners were all done at the Tarmiya site.

14. A second facility, a replica of Tarmiya, was being constructed at Ash Sharqat. According to information provided during the inspection, construction at Ash Sharqat started shortly after that at Tarmiya but none of the major buildings had been commissioned. The overall state of completeness was about 85 per cent at the time when most of the facility was destroyed. There was no sign that installed equipment had been removed, as had happened at other sites. The electric power supply to the site is very substantial and, while installation was not complete, the substation serving the site would certainly provide power at a level equivalent to that at Tarmiya. At the time when this site was inspected, the Iraqi authorities had not declared it as a nuclear facility; they stated the purposes of the installations at Ash Sharqat to be the protective coating of large pipes and containers and the production of machine tools. The Iraqi authorities have since stated that the Ash Sharqat facility was constructed from the plans used at Tarmiya. Further, they have indicated that the replication of important buildings had become a policy of the Iraqi Government. It is not clear whether Iraq intended to utilize the Ash Sharqat facility for uranium enrichment as long as the Tarmiya facility continued to function.

E. Material and equipment declarations*

15. Declarations of material directly associated with the operation of EMIS development units in Building 80 at Tuwaitha were provided to the team on the last day of the inspection period. Milligram quantities of uranium enriched up to a level of 40-45 per cent and a few kilograms of uranium depleted down to a level of .02 per cent were included. Material in five enrichment ranges (up to 10 wt. per cent U-235) resulting from the testing of EMIS production units at Tarmiya was declared, and samples were taken. Again, only small amounts of material were involved. This material was declared on 7 July as about 0.5 kg with an average enrichment of 4 per cent.

16. All tell-tale equipment at Tuwaitha, Tarmiya and the Mosul Production Facility had been removed and turned over to the Iraqi Army for destruction and concealment. The Army proceeded to transport the equipment to remote locations where much of it was destroyed and buried. Equipment from Tuwaitha and Tarmiya was distributed among locations 1-5 and 8, and equipment from the Mosul Production Facility was taken to locations 6 and 7 (near Mosul). Much of the equipment was destroyed to the point where it was no longer recognizable. The inspection team tried to concentrate on major EMIS components identified as end pieces, double-pole magnets with coils, vacuum chambers, liners, ion sources and collectors. The end pieces, magnets and vacuum chambers could not be destroyed completely and, given the circumstances, the inventory was reasonably consistent with Iraqi declarations. However, no collectors and only one ion source were found. Several pieces of a collector were eventually provided, but the locating of ion sources and collectors will have to be a major follow-up activity. Iraq's clarification dated 18 July included components (but no ion sources or collectors) for six 600-mm separators intended for installation at Tarmiya. With the exception of one dipole and several coils, this equipment has not been found by the inspection team. The equipment inventories at locations 6 and 7 are consistent with the declared purpose of the Mosul Production Facility. Facilities where EMIS components were fabricated were identified by Iraq. Some of these facilities had been inspected before the declaration, during the second IAEA on-site inspection, as a result of designation by the Special Commission.

17. In the opinion of the inspection team, the broad goals cited by the Vice-Chairman of the Iraqi Atomic Energy Commission neither require nor justify the construction of a facility the size of Tarmiya, much less two such facilities. Design drawings of Building 33 and Building 245 show a combination of high-capacity/modest separation factor units and low-capacity/high separation factor units. This is the type of arrangement that would be configured if the goal was to produce highly enriched uranium. Design data provided by Iraq indicate that if Tarmiya had become fully

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* For the area of Tuwaitha and Tarmiya and equipment locations 1-8, see the map contained in annex II to the present report.

operational, with 90 separators running at design capacity, up to 15 kilograms a year of highly enriched uranium or proportionally more uranium at lower enrichments could have been produced using natural uranium as the feed.

F. Gas centrifuge enrichment

18. In the 7 July declaration, Iraq listed certain gas centrifuge activities, equipment and components. Additional data were also made available, including information about a planned project to build a 100-machine gas centrifuge cascade. Iraq claimed that it had not progressed beyond the point of conducting single-machine trials with UF_6 gas and that the technical specifications for its gas centrifuge had not yet been fully determined. It was also claimed that it had had only very limited capabilities for centrifuge component manufacturing and no significant stockpiles of special materials (e.g., 350-grade maraging steel). In addition, it was claimed that there had been only very limited, laboratory-scale activities with UF_6.

19. On the basis of the evidence available to date, the inspection team cannot draw conclusions as to whether Iraq's gas centrifuge declarations are complete. A statement made regarding the technical status of machine operations and performance which had been achieved appears plausible, though its accuracy cannot be verified. The precise status of the "planned" project to build a 100-machine gas centrifuge cascade remains a question mark. Furthermore, it appears probable to the team that the full extent (material, equipment and locations) of Iraq's gas centrifuge component manufacturing infrastructure has yet to be revealed.

II. NUCLEAR MATERIAL VERIFICATION

20. In addition to the reverification activities performed on the nuclear material presented to the first inspection team, the following quantities of nuclear material stated in the declaration of 7 July were verified:

	(kilograms)
Yellow cake	331 368 (corrected value)
UO_2	116 173
UCl_4	2 577
UF_6	0.465
ADU	1 850
UO_3	2 050
UF_4	310 (corrected value)
UO_4	2 255

Also, one drum of scrap material and two drums of UO_4 sample bottles which had not been included in the 7 July declaration were brought to the Tuwaitha site and verified. The weights of this material were not provided and, owing to its late arrival, it was not possible to determine them. Furthermore, 235 kg of natural uranium in U_3O_8 form and four natural uranium fuel elements, which had previously been under safeguards and which were recovered from the rubble after the first inspection, were brought to the storage area at Tuwaitha and verified. The irradiated heavily enriched uranium (HEU) fuel elements in the IRT 5000 reactor were fully verified during the inspection.

21. Hot cells and glove boxes. The hot cells and glove boxes present at Tuwaitha were all inspected, and all the manipulators of the hot cells which had not been severely damaged were sealed for unique identification purposes.

22. Removal of fuel items. The conditions for removal and transportation of both fresh and irradiated highly enriched fuel elements were examined and discussed with the Iraqi authorities. In order to minimize the costs, the Iraqi authorities expressed the wish to perform as many of the activities as possible involved in the removal of fresh fuel and the loading of irradiated fuel into transport containers. Further discussions on this matter will take place in the near future.

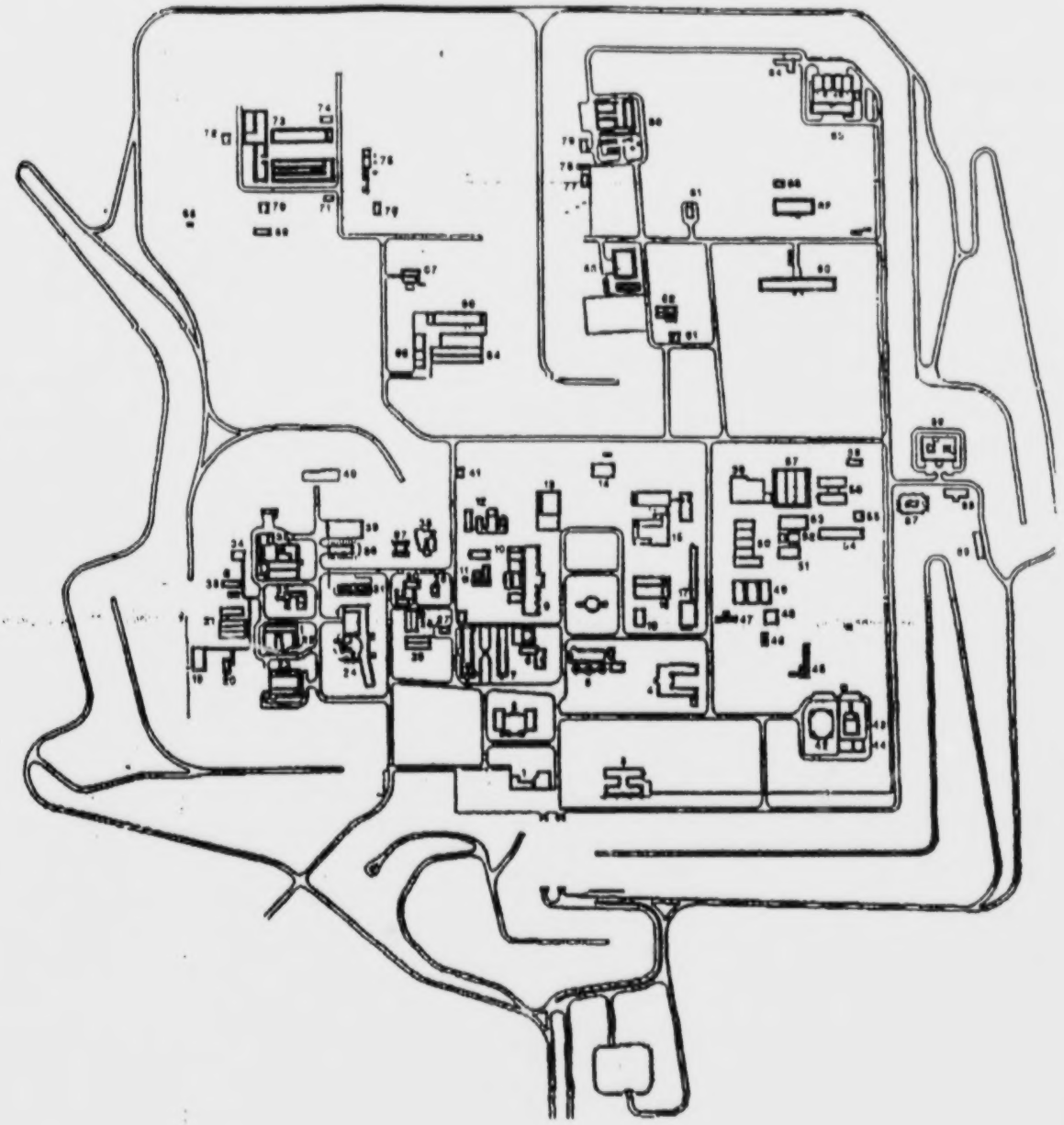
III. OTHER INSPECTIONS

23. Facility near Tuwaitha. The third inspection team examined a facility which the Iraqi side had identified as the Engineering Research Centre under the Ministry of Higher Education. The facility was surrounded by a low berm and a fence and had guard towers at each fence corner. Most of the equipment had been removed but some evidence found in the buildings suggested that the facility was a forensic laboratory of the Ministry of the Interior. The team is confident that no nuclear activities were conducted at the facility.

24. Al Qa Qaa Facility. At the invitation of the Iraqi authorities, inspectors visited this facility, which was declared to be a high-explosive testing facility. It did not appear to the inspectors that the facility possessed the diagnostic capability to support other than conventional explosive and ordnance production.

Annex I

TUWAITHA SITE MAP



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Annex II

MAP OF LOCATIONS